

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT : SIMON J. BROADLEY)
SERIAL NO. : 09/478,578)
FILED : January 6, 2000) Ex. K. Nguyen
FOR: : SELF-OSCILLATING VARIABLE) Group 2817
FREQUENCY CLOSED LOOP)
CLASS D AMPLIFIER)

AMENDMENT AND REQUEST FOR RECONSIDERATION

Hon. Commissioner of
Patents and Trademarks,
P.O. Box 2327
Arlington, VA 22202


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TECHNOLOGY CENTER 2817
#15/D
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Dear Sir:

This is in response to the Office Action of August 28, 2002, in the above-identified application.

Kindly amend the application as follows.

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on January 28, 2003


TOD R. NISSELE, Reg. No. 29,241
January 28, 2003
DATE

1 IN THE CLAIMS

2
3 Delete Claims 7 to 9. Insert new Claims 10 to 12.
4

5
6 The foregoing amendments are reflected in the attached **APPENDIX I:**
7 **Replacements, Deletions, Additions** and **APPENDIX II: Marked up Versions.**
8

9 REQUEST FOR RECONSIDERATION

10
11 The Examiner's thoughtful attention to this application is sincerely
12 appreciated.
13

14
15 Reconsideration of the rejections set forth in the Office Action of August 28,
16 2002, is respectfully requested in view of the foregoing amendments and following
17 remarks.
18

19
20 The Invention

21
22 Applicant provides a class D amplifier. Applicant's amplifier:

- 23
24 1. Does not include a constant cycling PWM.
25
26 2. Use a single switching output.
27
28

1 3. Is a closed loop amplifier.
2

3 The Prior Art
4

5
6 The Nguyen reference (U.S. 5,949,282) does not appear to disclose the
7 novel features of Applicant's amplifier.
8

- 9 1. Nguyen uses a generic fixed frequency PVM commonly found in Class D
10 amplifiers:
11

12 *"...the normal operation of the power FET's in output stage 102, which are*
13 *constantly cycling on and off in accordance with the output of PWM 101."*
14 *Col. 1, lines 62 to 64.*
15

16
17 Applicant's invention does not include a constant cycling PVM. This is
18 shown in Fig. 3 of the application where as the audio output, feedback (21),
19 reaches the power supply rails, VCC and VEE, the output stage (16) latches,
20 thus exhibiting the **variable switching, non-continuous cycling** of the
21 output signal (16).
22

- 23
24 2. Nguyen uses either two push-pull outputs or a H-bridge. Nguyen describes
25 two separate drive signals, HI_OUT and LO_OUT. Each of these drive
26 signals are fed to separate output filters (103 & 104), then to the speaker
27 105. Each side of the speaker (105) is connected to a separate output filter
28

1 (103 & 104) and the drive signal, HI_OUT and LO_OUT.

2
3 In contrast, Applicant's invention uses a single switching output (5) that is fed
4 to a single output filter (19) and to one side of the speaker (20). Applicant's
5 output is a **single push-pull output**.

6
7
8 3. Nguyen uses an open loop feedback. Nguyen refers to the output stage
9 (102) as the high digital driving signal (HI_OUT) and the low digital driving
10 signal (LO_OUT). The feedback (REF_SIGNAL) for the error amplifier circuit
11 is from the output stage (102), the digital driving signals (HI_OUT &
12 LO_OUT). Further, the Nguyen reference specifically outlines the
13 implementation as taking the feedback (REF_SIGNAL) prior to the output
14 filters (103 and 104) from the reference signal amplifier circuit (207)
15 connected to HI_OUT and LO_OUT generated by the output stage (102).

16
17
18 In contrast, Applicant's invention uses a closed loop feedback by taking the
19 feedback (21) from the output filter (19) back to the error amplifier circuit (14)
20 without consideration of the output stage (16).

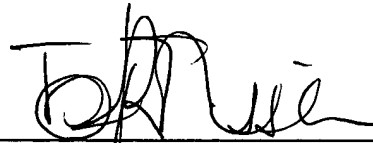
21
22
23 Consequently, Applicant respectfully submits that the invention is not rendered
24 obvious under 35 U.S.C. Section 103 by the Nguyen reference.

1 The Claims

2
3 New Claims 10 to 12 are identical to canceled Claims 7 to 9, except that each
4 of the new Claims has been amended to recite the non-continuous cycling PWM, single
5 switching output, and closed loop features noted above.
6

7
8 If the Examiner finds merit in the foregoing remarks and amendments, it is
9 believed the application is in condition for allowance, and such action is earnestly solicited.
10

11 Respectfully submitted,

12
13 
14

15 TOD R. NISSELE, Reg. No. 29,241
16 TOD R. NISSELE, P.C.
17 P. O. Box 55630
18 Phoenix, Arizona 85078
19 Tel: 602-494-8700
20 Fax: 602-494-8707
21 E-mail: nissle@nissle.com

22 Attorney's Docket No. 995-P-3
23
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APPENDIX I: Replacements, Deletions, Additions

REPLACEMENTS

- I. Title: None.
- II. Specification: None.
- III. Claims: None.
- IV. Abstract: None.

DELETIONS

- I. Title: None.
- II. Specification: None.
- III. Claims

Delete Claims 7 to 9.

- IV. Abstract: None.

ADDITIONS

- I. Title: None.
- II. Specification: None
- III. Claims

Add new Claims 10 to 12.

10. A self oscillating audio Class D amplifier, comprising
- (a) a detector for receiving a PWM waveform control signal and producing a digital waveform switching signal to activate one of a pair including a positive switch and a negative switch to correct gain produced by the Class D amplifier;
 - (b) an output stage including a positive switch and a negative switch *comprising a single switching output*, said output stage receiving said switching signal and activating one of said switches to produce a *variable switching non-continuous* digital driving signal;
 - (c) an output filter to receive said digital driving signal, remove switching noise and provide an amplified non-inverting audio analog output signal to drive a load;
 - (d) a non-inverting, *closed loop* negative feedback error amplifier circuit to
 - (i) receive said amplified analog output signal and compare said output signal to said input signal for gain-correction purposes, and
 - (ii) produce said PWM waveform control signal;

DI
said amplifier self-oscillating. ^{0.99} repeated

11. A self oscillating audio Class D amplifier, comprising
- (a) a detector for receiving a PWM waveform control signal and producing a digital waveform switching signal to activate one of a pair including a positive switch and a negative switch to correct gain produced by the Class D amplifier;
 - (b) an output stage including a positive switch and a negative switch *comprising a single switching output*, said output stage receiving said switching signal and activating one of said switches to produce a *variable switching non-continuous* digital driving signal;
 - (c) an output filter to receive said digital driving signal, remove switching noise and provide an amplified non-inverting audio analog output signal to drive a load;
 - (d) a non-inverting, *closed loop* negative feedback error amplifier circuit to

- (i) receive said amplified analog output signal and compare said output signal to said input signal for gain-correction purposes, and
- (ii) produce said PWM waveform control signal;

the operation of said amplifier slowing as the magnitude of the error in gain increases, said amplifier self-oscillating. *repeated*

12. A self oscillating audio Class D amplifier, comprising

- (a) a variable frequency zero crossing detector for receiving a PWM waveform control signal and producing a digital waveform switching signal to activate one of a pair including a positive switch and a negative switch to correct gain produced by the Class D amplifier;
- (b) an output stage including a positive switch and a negative switch *comprising a single switching output*, said output stage receiving said switching signal and activating one of said switches to produce a *variable switching non-continuous* digital driving signal;
- (c) an output filter to receive said digital driving signal, remove switching noise and provide an amplified non-inverting audio analog output signal to drive a load;
- (d) a non-inverting, *closed loop* negative feedback, error amplifier circuit to
 - (i) receive said amplified analog output signal and compare said output signal to said input signal for gain-correction purposes, and
 - (ii) produce said PWM waveform control signal;

the operation of said amplifier slowing as the magnitude of the error in gain increases, said amplifier self-oscillating. *repeated*

IV. Abstract: None.



APPENDIX II: Marked Up Versions

Marked Up Versions

I. Title: None.

II. Specification: None.

III. Claims: None.

IV. Abstract: None.



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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : SIMON J. BROADLEY
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Examiner : K. Nguyen
Group : 2817
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AMPLIFIER
Attorney Docket No.: 995-P-3

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TOD R. NISSLER, Reg. No. 29,241

01/28/03

Date